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# PATENT SPECIFICATION

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## (54) PORTABLE AIR FILTERING DEVICE

(71) We, WOLFGANG HAUFF, a citizen of Canada, of 235 Keith Road, Vancouver, B.C. Canada, and JOHN WILFRED TIDLAND, a citizen of the United States of America, of 2084 S.W. Linnell, Roseburg, State of Oregon, United States of America do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to new and useful improvements in portable air filtering devices.

15 Face pieces with forced air means have heretofore been employed to furnish filtered air to a user to protect the user from outside polluted air. Such devices for example are shown in U.S. Patents No. 3,112,745  
 20 and 3,467,965. Apparatuses such as shown in these patents as well as other patents have inherent disadvantages one of which is that the ventilating protective devices are complex in construction and bulky to wear. This  
 25 is especially so for apparatus of this type which is worn as complete head covers or hoods. Another disadvantage of prior apparatuses is that a single portable filtering unit cannot conveniently be adapted for use  
 30 with other types of face pieces, thus limiting the device to a particular use. The above disadvantages also make the prior devices costly to manufacture and uneconomical to market.

35 An aim of the present invention is to provide a portable air filtering device which overcomes disadvantages of prior devices and in general comprises a simplified, efficient lightweight and versatile structure.

40 According to the present invention, there is provided a portable air filtering device comprising:

- (a) a housing arranged to be supported on the body of a person,  
 45 (b) said housing having at least one threaded open end,  
 (c) a perforated threaded cap removably mounted on the open end of said housing,  
 50 (d) a filter disc removably mounted on

said cap,

- (e) an outlet on said housing,  
 (f) a flexible hose having one end connected to said outlet,

(g) a battery pack in said housing, 55

(h) a blower in said housing driven by said battery pack and arranged to draw in air to be filtered through said perforated cap and discharge it out said outlet,

(i) a face piece, 60

(j) and means removably attaching the other end of said flexible hose to said face piece.

One feature of the invention is that a filter blower unit has universal application to 65 most types of face pieces. In one embodiment said face piece includes a head band arranged to be supported on the head, said head band having an air passageway in communication with said hose, said face 70 piece also including a shield portion mounted on said head band and arranged to extend in front of the face of the wearer, and means defining a forwardly directed opening in said air passageway through which filtered air is arranged to be ejected forwardly substantially perpendicular against said shield portion whereby the ejected air diffuses in all directions to prevent polluted air from being drawn in between the shield por- 80 tion and the user's face.

The head band preferably has means for detachably supporting various types of shield portions so that a single head band can be used with various types of shield por- 85 tions to suit the condition at hand.

In other embodiments, the filter blower unit can be used with a respirator face mask or with an oxygen mask.

The invention is described further, by way 90 of example, with reference to the accompanying drawings, wherein:

Figure 1 is a side elevational view of a portable air filtering device for face masks embodying principles of the present inven- 95 tion;

Figure 2 is a rear elevational view of the invention taken on the line 2-2 of Figure 1;

Figure 3 is a sectional view taken on the line 3-3 of Figure 1;

100

Figure 4 is a side elevational view of another application of the present invention;

Figure 5 is an enlarged sectional view taken on the line 5-5 of Figure 4;

Figure 6 is a sectional view of an adapter providing use of the invention in the manner shown in Figure 4 but with a different form of face mask; and

Figure 7 is a side elevational view of still another application of the present invention.

With particular reference to the drawings, and first to Figures 1-3, a first concept of the invention comprises a face piece comprising a head band 10 and a shield portion 46. The head band member 10 has a rear arcuate portion 12 arranged to engage the back of the head and a front arcuate portion 14 arranged to engage the front of the head. Arcuate portion 14 or rear arcuate portion 12, or both, are preferably formed from a resilient or stretchable material which provides a good fit and adjustment on the head. An inner lining 16 may be used if desired. The head band includes a lateral strap 18 which fits over the top of the head. This strap as well as the head band may have conventional size adjustment means, not shown, if desired.

Front portion 14 is hollow and forms a passageway 20 for the flow of filtered air. A forwardly directed opening 22 is provided in the passageway 20.

Head band portion 14 is provided with side extensions 24 having a telescoping connection with upper ends of a Y-shaped manifold 26 connected to a flexible conduit 28. Conduit 28 connects into a filter blower unit housing 30 in which is incorporated a blower 32, a battery pack 34, and suitable conventional circuitry including an on-off switch 36. Housing 30 has suitable means for support on the body of the user in a convenient position and for this purpose may include a clip 37 for engagement with the user's belt.

Opposite ends of the housing have caps 38 threadedly mounted thereon, and such caps have an apertured or mesh wall 40 allowing for the entrance of air to be filtered. Each cap 38 removably holds a filter disc 42 therein for filtering the air to be supplied to the head band. These filters are easily replaced by unthreaded displacement of the caps 38. The threaded ends of the housing 30 are of the same size and thread structure as that used on conventional respirator face masks so that existing caps for such respirator face masks can be employed for the caps 38 and the filters may comprise conventional disc-type filters now used on existing face masks.

The head band 10 has side connections 44 of conventional design for removably receiv-

ing the shield portion 46. The connections 44 similarly have conventional means for holding the mask vertically or in a position pivoted up away from the face. Such connecting structure is well known in the art and is not detailed.

In the operation of the arrangement of Figures 1-3, forced air from the blower 32 enters through the apertured caps 38 and filters 42 and is forcefully ejected through the opening 22. Since the air is ejected perpendicularly against the mask, it diffuses in all directions and discharges evenly around the open spaces between the mask and the user's head. Since the air is diffused evenly in all directions, an air barrier is provided around the entire mask and thus no polluted air is drawn in through spaces around the mask.

Any type of shield portion can thus be mounted on the head band and a consumer can apply the type of shield which accommodates a specific purpose. For best operation of the invention, it is desired that the shield portion 46 have rearwardly turned portions 48 at the sides, a rearwardly turned portion 50 at the top, and a rearwardly turned portion 52 at the bottom. Such structure provides a substantially equal distribution of air around the face of the user to maintain filtered air in such face area at all times.

The shield portion 46 preferably has cut back portions 54 on the sides to allow the user to turn his head and furthermore has a bead 56 around the rearward edges for securement to a head cover, hood, or the like.

Another concept of the invention comprises the use of the filter blower unit 30 with a respirator face mask 60, Figures 4 and 5, such unit 30 using a blower 32, caps 38, filters 42, etc. the same as in Figure 2. Mask 60 is of conventional construction and fits in an air tight connection around the nose and mouth of the wearer. This type of mask has a front threaded projection 62 arranged to receive a cap 64. In the conventional arrangement and use of such a mask, the cap used therewith which is similar to cap 38 in Figure 2, houses a filter disc the same as filter disc 42. In the concept of the present invention, however, a filter disc is not used in cap 64 since the air is already filtered in the filter blower unit 30, although of course an additional filter may if desired be used in the mask.

Instead of using a conventional cap, the cap 64 comprises an adapter cap arranged for threaded connection on the projection 62 of the conventional mask and having a pipe elbow 66 arranged at one end for plug-in connection with the hose 28. The other end of elbow 66 has a swivel connection 67 with the cap 64. Thus, not only does a concept of the invention have means for supply-

ing a fresh layer of air across a person's face as in Figure 1 but such fresh air could be supplied to a respirator face mask as in Figure 4.

5 In some conventional face masks 60', Figure 6, the projection 62' has internal threads, and in order to apply the present invention to such structure, an adapter ring 68 is employed having a pair of external  
10 threaded portions 70 and 72, the threaded portion 70 being of a structure to fit the internal threads of projection 62' and the threaded portion 72 being of a structure to fit the internal threads of a cap 64 having  
15 the same structure as the cap 64 in Figures 4 and 5. Thus, the filter blower unit can be applied to respirator face masks with internal threads at the front.

A concept of the invention also can be  
20 associated with an oxygen-type mask 74, Figure 7. Such type of mask fits around the nose and mouth of a wearer but as distinguished from the mask 60 in Figure 4, no means for holding a filter is employed. The  
25 hose 28 of the filter blower unit 30 is fitted onto a connector 76 that forms a part of the mask and which in conventional use is connected to an oxygen line.

According to the present invention, filtering means is provided which can be used  
30 with substantially any type of face piece. By the specific arrangement of air ejection from the head band in the concept of Figure 1, an air barrier is provided around the user's face  
35 which, while allowing the shield portion to be suitably spaced from the face prevents any entrance of polluted air around the mask. Furthermore, since the air is ejected straight out and diffused, there are no  
40 uncomfortable currents of air flowing past the face. Another feature of the present invention is that conventional on the market filters 42 may be used so that special filters do not have to be purchased.

#### 45 WHAT WE CLAIM IS:-

1. A portable air filtering device comprising
  - (a) a housing arranged to be supported on the body of a person,
  - 50 (b) said housing having at least one threaded open end,
  - (c) a perforated threaded cap removably mounted on the open end of said housing,
  - 55 (d) a filter disc removably mounted in said cap,
  - (e) an outlet on said housing,
  - (f) a flexible hose having one end connected to said outlet,
  - 60 (g) a battery pack in said housing,
  - (h) a blower in said housing driven by said battery pack and arranged to draw in air to be filtered through said perforated cap and discharge it out said outlet,
  - 65 (i) a face piece,

(j) and means removably attaching the other end of said flexible hose to said face piece.

2. A portable air filtering device as claimed in claim 1 wherein both ends of said housing are open and each of said open ends threadedly supports a perforated cap and a filter disc therein.

3. A portable air filtering device as claimed in claim 1 or 2 wherein said face  
75 piece includes a head band arranged to be supported on the head, said head band having an air passageway in communication with said hose, said face piece also including a shield portion mounted on said head band  
80 and arranged to extend in front of the face of the wearer, and means defining a forwardly directed opening in said air passageway through which filtered air is arranged to be ejected forwardly substantially perpendicular against said shield portion whereby  
85 the ejected air diffused in all directions to prevent polluted air from being drawn in between the shield portion and the user's face.

4. A portable air filtering device as claimed in claim 3 including means on said head band removably attaching said shield  
90 portion thereto whereby one head band is arranged to receive a variety of shield portions according to a desired usage.

5. A portable air filtering device as claimed in claim 3 or 4 wherein at least a portion of said head band is formed of stretchable material so as to fit various head  
100 sizes.

6. A portable air filtering device as claimed in claim 3, 4 or 5 wherein said shield portion has rearwardly turned portions at the sides and at the top and bottom.  
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7. A portable air filtering device as claimed in claim 1 or 2 wherein said face piece comprises a respirator mask arranged to have an airtight fit around the nose and mouth of the wearer.  
110

8. A portable air filtering device as claimed in claim 7 wherein said respirator mask has an externally threaded front projection and a threaded cap removably mounted on said projection, said means  
115 removably attaching said other end of said flexible hose to the face piece including an elbow portion having a swivel connection to said threaded cap and a removable connection to said flexible hose.

9. A portable air filtering device as claimed in claim 7 wherein said respirator mask has an internally threaded front projection, a hollow adapter member having first and second exterior threaded portions,  
125 the said first threaded portion being threadedly engaged with said projection, and a threaded cap removably mounted on said projection, said means removably attaching said other end of said flexible hose  
130

to the face piece including an elbow portion having a swivel connection to said threaded cap and a removable connection to said flexible hose.

- 5 10. A portable air filtering device as claimed in claim 1 wherein said face piece comprises an oxygen type mask arranged to have an airtight fit around the nose and mouth of the wearer.
- 10 11. A portable air filtering device con-

structed substantially as herein particularly described with reference to and as illustrated in Figs. 1 to 3; or Figs. 4 and 5; or Fig. 6; or Fig. 7 of the accompanying drawings.

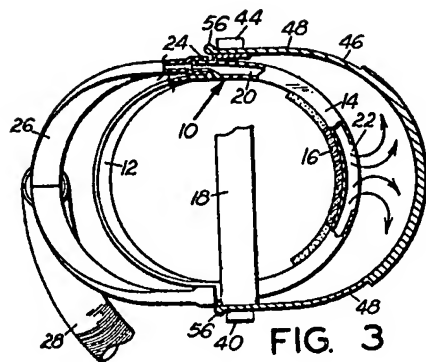
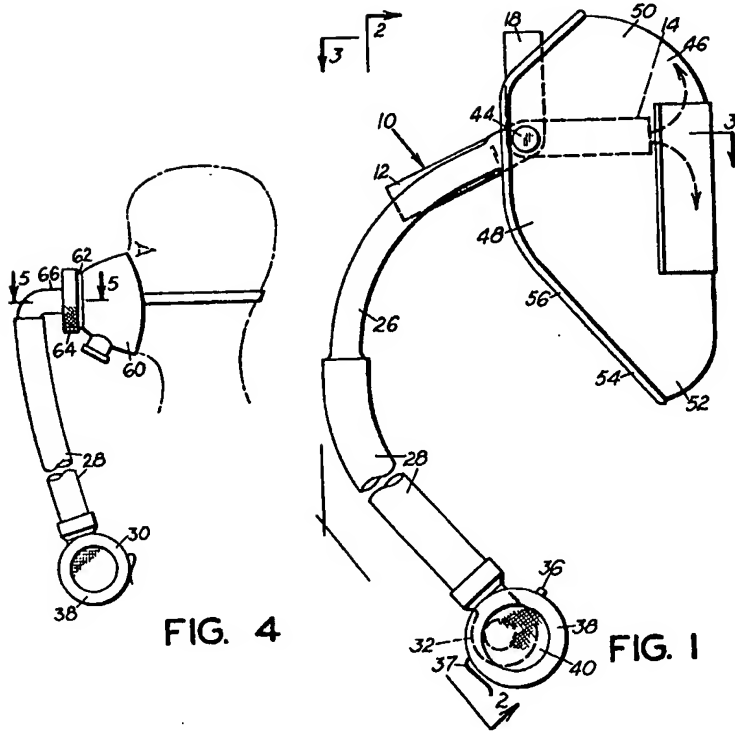
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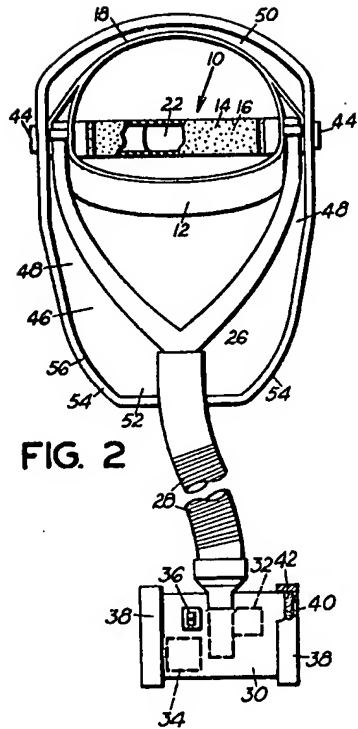


FIG. 2

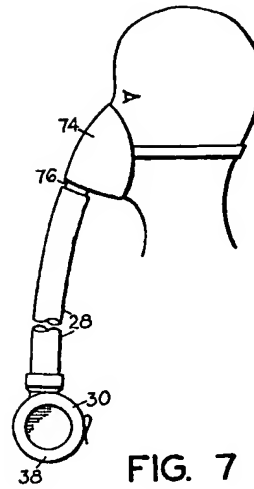


FIG. 7

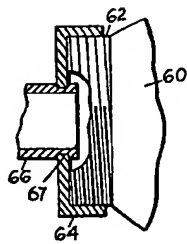


FIG. 5

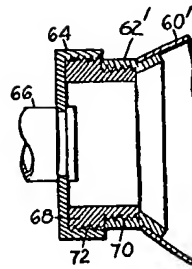


FIG. 6

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